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Accounting for Carbon Dioxide Emissions: The Context and Stakeholders Matter

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Abstract:
The article discusses factors that influence accounting for carbon dioxide emissions. The process is said to involve determining the information that would be useful and the accountant's ability to make meaningful measurements. The World Resources Institute and World Business Council for Sustainable Development (WRI/WBCSD) developed a three-layer emissions accounting approach for corporate inventories which can accommodate different foci and levels of engagement.

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Accounting for Carbon Dioxide Emissions:
The Context and Stakeholders Matter

Accounting for carbon dioxide (CO_2) emissions is no longer just counting carbon atoms. It turns out that how you account for CO_2 emissions and the answers you get depend on the questions you ask, the framework of the query.

There are now many who care about accounting for CO_2 emissions: from scientists interested in the global carbon cycle to environmentalists concerned about global climate change, regulators overseeing international or subnational agreements, businesses concerned about regulations or public good will, traders interested in markets for emissions permits, stockholders concerned about corporate risk, and good citizens just wanting to do the right thing. But there is not a single answer for all questions, and for many questions, we do not have a consensus on how the accounting should be done. Questions remain, for example, about system boundaries, baselines, temporal patterns, responsibility, valuation, and uncertainty.

Ultimately, we have to be concerned with both what information would be useful and our ability to make meaningful measurements. We confront the accountant's issue of materiality: What information would significantly influence decision makers and therefore should be measured? What starts as physical measurements of carbon flows has widespread implications, and there is much to be learned from both scientists and engineers as well as from the accountants who worry about assets and liabilities. There is a feedback from financial and political considerations to physical and environmental accounting.

A good current example has to do with emissions from biomass energy production.1 At the level of a discrete facility, how does one compare emissions from a renewable fuel with emissions from a nonrenewable fuel? With a coal-fired power plant, it may be sufficient, for many purposes, to simply measure the CO_2 discharged from the stack. But, for a biomass fuel, it may be appropriate to recognize further that the fuel is connected to the land and potentially renewable, with CO_2 removed from the atmosphere by the growing biomass. In this case, where are the appropriate system boundaries for accounting, and how do we deal with emissions from burning wood now if the CO_2 emissions will be countered by uptake in growth, either at a later time or in a nearby portion of the forest? Also, should we compare the impact on the biosphere with the current biosphere or with the path of the biosphere over some alternate ("business as usual") scenario? The challenges are differ-ent if not everyone is applying full carbon accounting, if only some parties are keeping count and only on selected and varying carbon flows (e.g., if accounting is required in the industrial sector, but not in the land-use sector, or in some countries, but not in all countries).

The Intergovernmental Panel on Climate Change (IPCC) has developed its Guidelines for National Emissions Inventories, and the World Resources Institute and World Business Council for Sustainable Development (WRI/WBCSD) has developed its widely used guidelines for corporate inventories (WRI/WBCSD 2007). But Searchinger and colleagues tell us that the IPCC system has a "critical climate accounting error" (Searchinger et al.), Johnson has suggestions about "getting biomass footprints right" (Johnson 2009), and the U.S. Environmental Protection Agency (US EPA)[1] unleashed a discussion on how to account for emissions from biomass fuels. The controversy over emission accounting is further fueled by the recognition that emissions currently do not have the same value as emissions years in the future, but there is no consensus on how to deal quantitatively with the time value of carbon.[2]

To accommodate different foci and levels of engagement, the WRI/WBCSD devised a three-layer emissions accounting approach for corporate inventories: Scope 1 incorporates direct emissions from an entity, scope 2 captures those indirect emissions released during the generation of purchased electricity or heat, and scope 3 entails other indirect emissions, such as those from extraction, production, and transport of purchased materials and from waste management, that is, a full life cycle assessment (LCA).

Along the same lines, but with renewable energy in mind, we envision multiple possible frameworks for accounting for the CO_2 emissions from an entity (figure 1):

1. The frame of operational control and financial responsibility. This would be an accounting of emissions that physically emerge from a facility, corporation, or political entity. This would include emissions for which the entity has physical control, for which it might be expected to pay taxes if emissions were taxed, or with which it might engage in emissions trading under a "cap and trade"

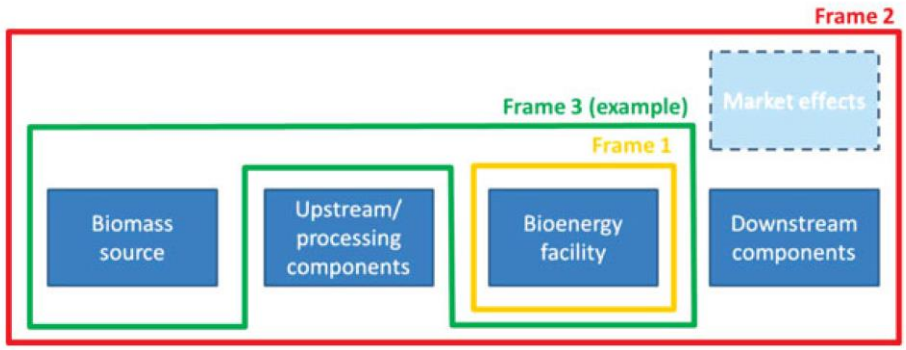

Figure 1 Potentially useful frames for entity-scale carbon accounting. Frame 1 includes only the entity, frame 2 is a life cycle assessment that includes (frame 2b) or does not include (frame 2a) off-site market effects, and frame 3 attaches some attributes of the fuel source (e.g., renewability) to the consuming entity.

system. These emissions can be considered a liability for the entity (Deloitte 2009). In general, these are scope 1 emissions, but scope 2 emissions could be easily added if they were not double counted at the power plant.

2. The frame of atmospheric impact and comparative evaluation. This would be an accounting such as represented in an LCA, where full emissions from construction, materials flow, and waste disposal are important considerations. This would enable the emission merits of one alternative for providing a good or service to be compared with a second alternative for providing the same good or service. This might include only directly induced emissions (attributional LCA[3]—frame 2a) or it might include emissions that are a consequence of market effects (e.g., indirect land-use change) (consequential LCA[3]—frame 2b). This frame includes scope 3 emissions.

3. The frame of resource renewability. Between these alternatives, we envision a frame that would characterize day-to-day operations of an entity, but attach some attributes of the fuel source to the consuming entity. This would be an accounting of emissions directly attributable to an entity in the context of its pressure on some potentially renewable resource, for example, the biospheric impacts of using a biomass fuel. This would fill the gap when taxes or other incentives are focused on only part of the full system, such as when power plants are regulated, but fuel sources are not, or when some political entities have regulations, but others do not. In essence, this would capture effects that lay beyond the facility site that were not accounted for in the regulatory environment, but were material, measureable, and too important to ignore.

This would allow us to distinguish between what is measured at the smokestack of a coal-fired boiler and what is measured at the smokestack of a biomass-fired boiler.

The existence of contending accounting frameworks has been recognized by Ascui and Lovell, who suggest that, for carbon accounting, there are “at least five overlapping frames of reference, namely physical, political, market-enabling, financial and social/environmental ...” (Ascui and Lovell 2011, 978). Although the frameworks overlap in many aspects, Ascui and Lovell describe a tension among frames. Frameworks differ in their specific focus and hence in the accounting boundaries and in the baseline against which emissions are accounted. Attributable emissions can differ by the framework chosen (i.e., according to the context or precise question posed). Public hearings on the EPA biomass fuels initiative[1] clearly revealed that different parties have different interests and preferences.

When evaluating the efficacy of these carbon accounting frameworks, there are challenges in applying the traditional financial accounting principles that determine the “usefulness” of information: predictive value; feedback value; timeliness; comparability; neutrality; representational faithfulness; and verifiability. Especially, in frames 2b and 3 as outlined above, we encounter the potential of trade-offs between materiality and representational faithfulness. It is an adage of accounting to monitor what you can measure, but there is concern that some elements can potentially be very important, yet very difficult, to evaluate. Use of biomass as a fuel, for example, could have both direct impacts on the area from which fuel is harvested and material leakage through market effects on land use elsewhere— the latter being particularly difficult to quantify. Comparability is an issue when accounting for biomass fuels and this suggests the utility of frame 3 described above.

Although we think it is important that accounting for biomass energy recognizes the linkage to the global carbon cycle and the renewability of the fuel, within the frame of resource renewability (frame 3) there are then substantive issues of defining baselines and system boundaries. This is particularly true for facilities based on wood combustion, where there is a large existing carbon stock, potentially a very long time cycle of growth and harvest, and where trees left in the forest could continue to grow and sequester additional carbon. The issues have to do with renewability and sustainability. So long as harvesting is less than or equal to replenishment, problems can reside with the individual entities. But individual solutions are no longer appropriate when harvest exceeds regrowth and system sustainability is compromised. It is then a problem of the collective, and we are concerned with the feedback value and the predictive value. Note that frame 3 can tell us whether the fuel is renewable, but frame 2 is required to impute carbon neutrality.

In the case of renewable biomass fuels, we need to define a renewable system and show how a combustion facility fits into that renewable system. The system boundaries must have sufficient spatial coverage to encompass both the combustion facility and the landscape that supplies the fuel and sufficient temporal coverage to encompass the scale of renewability.

The bottom line is that accounting for CO_2 emissions needs to provide information useful to stakeholders, while recognizing that multiple stakeholders have different needs. There is a need to understand the risks to the environment and investors. To have predictive value, accounting has to reveal risk and uncertainty, recognize what the entities can control and what they can measure, and start by asking, “What exactly is the question?”

Notes

1. US EPA, 2011. Accounting Framework for Biogenic CO_2 Emissions from Stationary Sources, predissemination peer review draft, Sept. 2011, 127 p, available at http://www.epa.gov/climatechange/ Downloads/ghgemissions/Biogenic-CO2-Accounting-Framework- Report-Sept-2011.pdf. See also the EPA Science Advisory Board Review of this document available at http://yosemite.epa.gov/sab/ sabproduct.nsf/57B7A4F1987D7F7385257A87007977F6/$File/ EPA-SAB-12-011-unsigned.pdf.

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3. SAIC (Science Application International Corporation), 2006. Life Cycle Assessment: Principles and Practice, Science Applications International Corporation, Reston, Va., 87 pp, available at http://www.epa.gov/nrmrl/std/lca/lca.html

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